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# ENTOMOLOGICAL NEWS

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CHARLES WILLISON JOHNSON
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CONTENTS

Jones—Another Oriental Mantis well established in the United States (Orthoptera: Mantidae) . . . . . 1
Rehn—Chief Morphological and Color Features separating Tenodera angustipennis and T. sinensis (Orthoptera: Mantidae) . . . . . 4
Beall—The Use of a Modified McIndoo Olfactometer for the European Earwig, Forficula auricularia (Dermaptera) . . . . . 6
Jacot—Ordinal Status of the Oribatoidea (Acarina) . . . . . 10
Bailey—Some Notes on California Thrips (Thysanoptera) . . . . . 14
Bromley—Corrections in Nomenclature (Diptera: Asilidae) . . . . . 15
Cole—Ant Communities of a Section of the Sagebrush Semi-Desert in Idaho, with Special Reference to the Vegetation (Hymenoptera, Formicidae) . . . . . 16
An Opportunity . . . . . 19
Fattig—Color Changes in Preserved Specimens of Dynastes tityus (Coleoptera: Scarabaeidae) . . . . . 20
Payne—A Parasitic Hymenopteron as a Vector of an Insect Disease . . 22
Entomological Literature . . . . . 23
List—Ninth Annual Rocky Mountain Conference of Entomologists . . . 26
Obituary—Dr. William Jacob Holland . . . . . 28

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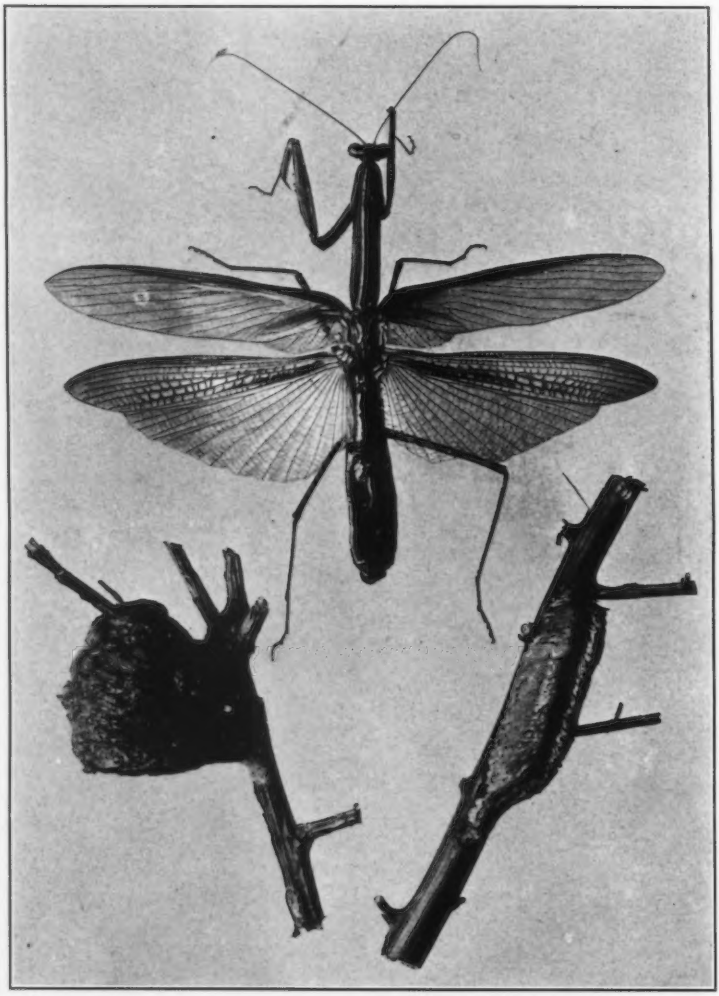

TENODERA ANGUSTIPENNIS SAUSS —JONES.

ADULT MALE.

EGG-MASS
T. SINENSIS.

EGG-MASS
T. ANGUSTIPENNIS.

ALL NATURAL SIZE.

ENTOMOLOGICAL NEWS

VOL. XLIV. JANUARY, 1933 No. 1

## Another Oriental Mantis well established in the United States (Tenodera angustipennis Saussure, Orthoptera: Mantidae).

By FRANK MORTON JONES, Wilmington, Delaware.

(Plate I.)

Since the publication (ENT. NEWS, IX, 144-145, Pl. IX, 1898) by Philip Laurent of a figure and brief account of the discovery in the United States of the oriental mantis, *Tenodera sinensis* Sauss., the large size of this insect, its grotesque shape and its postures often interpreted as threatening, its presence in cities and in suburban gardens, have attracted interested attention wherever it has appeared. In 1918 (Bull. Bkln. Ent. Soc., XIII, 73-76) William T. Davis gave a summary of its spread in the years between 1896 and 1918; and in the present year Stanley W. Bromley (Bull. Bkln. Ent. Soc., XXVII, 196-201, 1932) has extended that record, showing a present distribution in Connecticut, New York, New Jersey, Pennsylvania, and Ohio. Northern Delaware may be added to that record, for the insect has been abundant here for a number of years.

This literature includes reference to the presence of another introduced mantis (*religiosa* Linn.) in New York State, and to the occasional adventive occurrence in northern States of a native species from the south; but nowhere do I find reference to a second large exotic species occurring and permanently established in our eastern States.

In September, 1930, near Vandyke, southwest New Castle County, Delaware, I found the egg-mass of a mantis which could not be attributed to *sinensis,* to *religiosa,* or to our native species, *carolina,* which nears its northern limit here. In 1931

and in the same general region I found more of these puzzling structures, but made no progress toward their identification. Further search in the spring of 1932 showed them to be present over a line extending at least two miles, eastward from the Maryland boundary through Vandyke, and I then brought several egg-masses from that locality and tied them out in my own garden at Wilmington, where they received no further attention until mid-September of this year (1932), when I captured an adult upon a garden shrub. Search was then commenced for further specimens, and an effort made to determine more accurately the distribution of the species, with these results:

Of this species, 26 adult mantids were captured and innumerable egg-masses were found, and the presence of the insect was traced across the width of the Delaware-Maryland peninsula from the western extremity of Middle Neck, Cecil County, Maryland, to Port Penn, New Castle County, Delaware, a distance of 16 miles. Eliminating Wilmington (where its presence may be attributable to my introduction of egg-masses from Vandyke), the northern limits of its observed distribution roughly follow the line of the Chesapeake and Delaware Canal. Search was not made south of Vandyke, so its distribution southward remains to be determined. At both the extreme western and extreme eastern stations for the insect, egg-masses were numerous, and they obviously represented the deposits of at least three successive years. Throughout this observed distribution no extensive plantings of exotic shrubs or trees suggest probable explanation of its presence.

I am indebted to Mr. J. A. G. Rehn for the identification of this insect as *Tenodera angustipennis* Sauss., a native of China, Japan, and Korea, and not hitherto recorded from the United States. Congeneric with *sinensis*, the adult insect (plate I) is indeed closely similar to that species in structure and appearance, and on casual examination might easily be confused with that species. As related, the present recognition of *angustipennis* as distinct is due to the finding of its

characteristic egg-mass. This (plate I), when attached to a twig, is roughly cylindrical, 40 to 60 mm. in length, about 14 mm. in diameter. At the end first deposited, it slopes to a mere coating of the twig, and at the other extremity is rather abruptly truncate. Above, it bears two deep and parallel longitudinal grooves about 5 mm. apart, and emergence of the young takes place from the raised area between the grooves. The surface of the egg-mass is marked throughout by narrow and obscure corrugations, laterally oblique, which probably indicate the location of successive deposits of eggs within the mass. When deposited upon a flat surface, the length of the mass is not modified, but the structure assumes a lower and more flattened form, sometimes attaining a width of 20 mm. with a height above the surface of attachment of 10 mm. Under no observed condition is the egg-mass of *angustipennis* mistakable for the familiar and almost globular deposit of *sinensis* (plate I).

The egg-masses of *angustipennis* are frequently attached to the twigs of shrubs or to the stems of tall herbs; but at field-margins, fence-posts and tree-trunks seem to be preferred sites. Illustrative of their abundance, twelve such deposits were counted upon a single post near St. Augustine Creek, south of Port Penn, Delaware.

The adult mantids exist in three color phases,—green, brown, and (more rarely) gray-brown. Mounts of the ♂ genitalia show close resemblance, and the arrangement and relative size of the spines of the fore legs seem identical in the two species. The more slender form of *angustipennis,* its proportionately shorter and narrower tegmina and wings, and their differences in color-pattern, are obvious from the accompanying figure; and no example of *angustipennis* was seen which presented any difficulty in recognition, when placed side by side with *sinensis.* Mr. Rehn has added to my obligation by making a careful comparative study of the two species as now abundantly represented in the collections of the Academy of Natural Sciences, and his notes will follow the present paper.

## Chief Morphological and Color Features separating Tenodera angustipennis and T. sinensis (Orthoptera: Mantidae).

By James A. G. Rehn, Academy of Natural Sciences, Philadelphia.

In size *Tenodera angustipennis* averages distinctly smaller and more delicate in both sexes than does *T. sinensis*, the latter being a heavier and more robust insect. The pronotum is more elongate proportionately in *angustipennis* with the collar having its margins less strongly converging cephalad, the cephalic extremity of the pronotum in consequence more broadly and bluntly rounded; the supra-coxal lobes are less expanded, in fact but little widened; the shaft has its margins more subparallel. These differences in pronotal structure are more decided in the female than in the male, the proportionately shorter, stouter pronotum of that sex of *sinensis* being distinctly different from the relatively slender one of *angustipennis*.

The tegmina of *angustipennis* are distinctly narrower and more attenuate than in *sinensis*, the ratio of width to length in males of *angustipennis* being 4.5 to 4.8, of the same sex of *sinensis* 4.2 to 3.8; apex of tegmina more sharply and evenly acute in *angustipennis* than in *sinensis;* marginal field of tegmina in distal half proportionately narrower in *angustipennis* than in *sinensis*. In *angustipennis* the wings are narrower, more attenuate, with the apex of the anterior field much more sharply and evenly acute; in the male greatest width of the wing is contained in the length of the same nearly 2.5 in *angustipennis*, as against 2.25 in *sinensis;* posterior field of the wing much less extensive in *angustipennis* than in *sinensis*.

Certain other less evident structural differences are to be found, such as the proportions of the facial scutellum and the degree of emphasis of the surface sculpture of the internal and ventral (i.e. extensor) surfaces of the cephalic coxae. These, however, cannot be appreciated as readily as those given above, and need not be emphasized in this connection.

In color it is at once evident that regardless of which color phase is represented the posterior or radiate field of the wings

in *angustipennis* is but slightly, if at all, infumate, while in *sinensis* the same area is markedly and completely suffused, except for hyaline areolation near the dividing vein. The striking wing color feature is, however, the longitudinal concentration of the infuscation of the anterior field of the same near the dividing vein, leaving a distinct, nearly clear longitudinal area in the region of the discoidal and median vein for a considerable portion of the wing length, the quadrate areolation caused by the fuscous pencilling of the veins and cross-veins in the marginal field being sharply emphasized, while in *sinensis* virtually all of the proximal two-thirds of the anterior field, aside from the proximal dark blotch, is regularly areolate with fuscous. The apex of the wings ranges in tone from lightly infuscate in an intensive color type to subhyaline with the veins narrowly brushed with pale fuscous to dull greenish in the respective color phases in more recessive individuals. The tegmina have the marginal field green as is usual in the other species of the genus, the discoidal field in the brown phase almost lacking any trace of the pale marmoration often seen in the brown phase of *sinensis*, the veins, however, more distinctly lined in green or brown than in the same phases of *sinensis*. The humeral trunk of the tegmina is more distinctly, definitely and completely lined with fuscous brown in both phases than in the same conditions of *sinensis*.

MEASUREMENT (IN MILLIMETERS) OF REPRESENTATIVE SPECIMENS OF BOTH SPECIES*

| | Length of body. | Length of pronotum. | Greatest width of pronotum. | Length of tegmen. | Greatest width of tegmen. | Greatest length of cephalic femur. |
|---|---|---|---|---|---|---|
| ♂, angustipennis | 66.5 | 23.2 | 5.1 | 47.8 | 10.6 | 15.2 |
| ♂, " | 61.6 | 24.5 | 5.1 | 50.2 | 10 | 15 |
| ♂, sinensis | 67.5 | 22.4 | 5.3 | 52.2 | 11.2 | 16 |
| ♂, " | 82.3 | 26.6 | 7.2 | 65.5 | 14 | 19.6 |
| ♀, angustipennis | 74 | 25.6 | 6.2 | 50.3 | 11 | 17.5 |
| ♀, " | 75 | 26.5 | 7 | 55 | 11.6 | 19 |
| ♀, sinensis | 88.2 | 27 | 7.9 | 54 | 13 | 20.7 |
| ♀, " | 91.5 | 29.4 | 8.9 | 68.5 | 15.2 | 23 |

* Measurements of *sinensis* are from specimens taken at various times in the vicinity of Philadelphia, those of *angustipennis* from material kindly presented to the Academy by Mr. Jones.

# The Use of a Modified McIndoo Olfactometer for the European Earwig, Forficula auricularia, (Dermap.).

By GEOFFREY BEALL, Dominion Entomological Laboratory, Chatham, Ontario.

## INTRODUCTION.

An attempt was made at the University of British Columbia to test the chemotropic responses of the European earwig, *Forficula auricularia,* L., during the winter of 1930-31.* This work was planned to be the basis of an attempt to solve the difficult problem of comparing the attractive properties, positive or negative, of various poisoned baits and their constituents. The more simple problem of the response of the earwig to common foods and chemicals was first studied with the object of discovering to what extent the anticipated methods were practicable, and is the subject of this paper. The results from these preliminary tests were unsatisfactory in that they apparently did not agree with the known behavior of the earwig. Therefore, the work was not extended to include tests on baits.

## APPARATUS.

A slightly modified form of the olfactometer* used by McIndoo in his investigations upon the responses of the potato beetle, *Leptinotarsa decemlineata,* Say., was employed. It was essentially a Y of glass tubing, like the original. However, the stem was longer and larger in diameter. Also the passage, at the junction of the stem with the arms, was not constricted as in the model olfactometer. The stem of the olfactometer had an inside diameter of one and a half inches, and the arms had a diameter of half an inch. Three short pieces of glass tubing were attached vertically to the Y near the crotch. The two on the arms served as intake and that on the stem as an outlet, for the air currents.

* Published by permission of Prof. C. M. Fraser, Department of Zoology, University of British Columbia. The work was conducted under the direction of Prof. G. J. Spencer, to whom I am greatly indebted for advice and assistance. To Prof. F. Dickson and Prof. M. J. Marshall, I am also obliged for assistance.

* McIndoo, N. E. 1926 U. S. Bureau Entomology. "An Insect Olfactometer", Jour. Econ. Ent. XIX, No. 3: 545-71, 8 Fig. Geneva, N. Y.

## Operation.

### *Air Movement.*

A bunsen suction pump was used to draw the air through the olfactometer. It was connected with the small vertical outlet on the stem. The air for one of the intake tubes on the arms of the Y was bubbled through a flask of water, then led through the odoriferous substance to be tested. The air for the other intake tube was only bubbled through the water. The intake tubes of the olfactometer were plugged with cotton, which served both as a filter against droplets or dust of the substance being tested and as a barrier against the occasional earwig which might attempt to ascend the tube. The outlet tube was similarly plugged. Stoppers were put in the ends of the Y when the apparatus was being used.

In a preliminary experiment, when no odoriferous substances were being tested, earwigs had shown a tendency to go into the arm of the olfactometer in which air was moving the more rapidly. Therefore, in the experiment proper, every effort was made to equalize the currents of air in the two intake arms.

All resistances to the air currents, such as the bends in the tubing and the depth of water in the flasks, on the two sides were balanced as closely as possible, in setting up the apparatus. Then pinch-cocks were used to help in the equalization. To further approach equality between the two currents, and to ensure a nearly constant rate of flow, the currents were each run through five feet of glass tubing, one millimeter inside diameter. The rate at which air was passing through each side of the intake systems was judged by the number of bubbles per minute in the flask of water on each side. A liter of air was drawn through the system in two minutes.

In order to eliminate the influence of bias between the arms on comparative readings between the two intake systems, the latter were changed over from one arm to the other after every two readings.

### *Earwig Stock Used.*

The earwigs used during December, 1930, and January, 1931, for this work had been taken as adults in September, 1930. They had been kept in the green-house or zoological laboratory in the meantime.

*Procedure in Experiment.*

Since earwigs avoid light, an effort was made to disturb them as little as possible before they were used in an experiment. Accordingly, before any readings were taken they were all counted out; after this they were kept in the dark until it was time to use them. In doing this, about eighty earwigs to be used in the course of the day were divided into lots of six of like sex. Each of these groups was placed in a two-inch vial. Individuals were used that had not been fed for from thirty to forty-eight hours. Each lot was, as a rule, employed only once in the course of a day, although sometimes groups were used a second time after an interval of several hours. Only adults were tested.

Substances to be tested were put in Erlenmeyer flasks or test-tubes. Air was bubbled through two inches of liquids or passed through three inches of fine, freshly mashed, solids.

After each reading, the arms of the olfactometer were cleaned with soft towel paper on the end of a flexible wire. Sometimes the stem was also cleaned. In order to keep the current as free as possible from odors, other than that being tested, rubber connections were reduced to a minimum by using glass and cork wherever possible.

In actually taking a reading, the apparatus was completely assembled, except that the stem of the olfactometer was open. One of the vials of earwigs was taken from the dark, uncorked and placed in the mouth of the stem as quickly as possible, and then the light was switched out. After an average period of fifteen minutes, the light was turned on and the position of the earwigs immediately determined.

It will be seen that in this work no attractive force, such as the light used by McIndoo, was present to draw the insects into the arms of the olfactometer. However, the natural restlessness of the earwigs was relied upon to bring some of them along the stem into the region of the odor.

*Results of Experiment.*

The actual results from a series of readings with various substance is shown below. Since all factors were practically the same in the two arms, it is assumed that an equal number of earwigs should have been obtained in each, that is a 1/1 distribution would be expected. By formula * the probable deviation from this ratio, for the numbers used, is calculated and shown against the observed deviation.

| Odoriferous substance | No. of readings | Period in minutes | Earwigs found at end of period in arm with odor | Earwigs found at end of period in arm without odor | Observed deviation from 1:1 distribution between arms | Probable deviation from 1:1 distribution between arms | Probability of experimental deviation from 1:1 ratio being due to chance |
|---|---|---|---|---|---|---|---|
| 95% ethyl alcohol | 32 | 15 | 31 | 48 | ±8.5 | ±3.0 | .06 |
| 7% ethyl alcohol | 9 | 10–20 | 9 | 24 | ±7.5 | ±1.9 | .009 |
| Concentrated solution of sodium arsenite in water | 32 | 15 | 36 | 43 | ±3.5 | ±3.0 | .4 |
| Pulverized fresh apple | 23 | 15-60 | 16 | 52 | ±18.0 | ±2.8 | 0 |
| Pulverized fresh liver | 44 | 15–60 | 30 | 90 | ±30.0 | ±3.7 | 0 |
| Crushed naphthalene† | 9 | 15 | 2 | 13 | ±5.5 | ±1.3 | .004 |

CONCLUSIONS.

To summarize the results from this experiment, it may be said that, on the whole, the response of the earwigs, when considered in the light of general observations, seemed abnormal for the substances tested. In the case of naphthalene the strong aversion shown toward its odor would have been anticipated. Also since sodium arsenite is not a volatile substance, the

* Formula used is $PE = \mp .6745 \left(\frac{p \cdot q}{N}\right)^{\frac{1}{2}}$

Where p = number in one arm
q = number in other arm
N = p + q

† In the case of the naphthalene the current of air was not passed through the substance but only through the upper part of a 500 cc. Erlenmayer flask which had one common moth-ball crushed in the bottom.

neutral response of the earwigs was apparently normal. The very strongly marked reaction against 7% alcohol, apple and liver is inexplicable. Particularly is this so in the case of the latter two foods which were eaten readily under free and caged conditions.

Since the results obtained with the common foods were so unsatisfaetory, and since time was not available to analyze the apparent discrepancies, further tests with earwig baits, which had originally been projected, were not carried out.

While the results obtained were apparently unsatisfactory, it should be noticed that only in the case of one substance, sodium arsenite, was the experimental deviation from a 1/1 ratio between the two arms, within the limits of standard deviation. In this case there were four chances in ten that the deviation obtained was a matter of chance. For all other substances, the probability that the observed deviation was due to chance was nowhere higher than six out of one hundred. In short, the earwigs did orient within the olfactometer to smell.

## Ordinal Status of the Oribatoidea (Acarina).

By Arthur Paul Jacot.

According to some of the most recent systems of classification,[1] the moss mites are placed in the suborder Sarcoptiformes with the Acaridiae, on the ground that (1) some of the larvae of the Oribatoidea resemble some of the Tyroglyphids and that (2) they have *in common* the following structures:

1. Reduction of mandible segments (to 2)
2. Reduction of maxillary palp segments (to 3-5)
3. Reduction of leg segments (to 5)
4. Absence of heart
5. Absence of "malpighian tubes"
6. Presence of pseudostigmatic organs
7. Presence of midgut caeca
8. Presence of complete alimentary canal.

Concerning these structures the following factors should be considered:

Reduction of number of segments is due to orthogenic trends and is therefore of phylogenic import.

[1] Vitzthum, H., 1931, Ordnung der Arachnida: Acari = Milben, *in*: Kükenthal and Krumbach, Handbuch der Zoologie, vol. 3, 160 pp., 161 figs.

Absence of heart is a character which is largely governed by size of body and has no true phylogenic value within an order. The absence may occur in any group of Arthropods in which the body is small enough. Moss mites rarely attain a body length of 2 mm.

Absence of "malpighian tubes" is also correlated with size and possibly diet. As moss mites have a well developed alimentary system and tracheal (aereating) system, an additional excretory system in so small a body would be unnecessary. This absence may therefore have no phyletic significance.

Pseudostigmatic organs are also developed in the Trombidiidae and absent in some of the primitive Oribatoidea.

Midgut caeca are found in varying degrees of development. For instance in the Oribatinae (old Damaeus) they are not developed or are merely angles of the ventriculus. One must therefore consider them an independent development.

Presence of a complete alimentary canal is a character which is largely influenced by feeding habits. Parasitic forms feeding on highly organized fluids have a tendency to reduction of posterior end of alimentary canal. This is true in other phyla of animals. The presence of the complete alimentary canal in the Oribatoidea is directly correlated with their vegetarian diet. The same high development of the alimentary tract, especially the intestine, is found in the vegetarian mammals, birds, fishes and others. It has no phylogenic significance.

Thus these structural characters, are due to size, diet and orthogenic trends.

Another viewpoint is to consider the points of *difference*. These are:

| | *Oribatoidea* | *Acaridiae* |
|---|---|---|
| Mouth parts | enclosed by rostrum | mostly extending beyond |
| Maxillary palp | 3-5 segmented | 3 segmented |
| Tracheae | 0-8 | 0-2 |
| Coxae | variously modified | I & II, III & IV united |
| Tarsi | without pennant, with 1-3 claws | with pennant and/or 1 claw |
| Body | usually highly chitinized | soft |
| Sexual dimorphism | absent | present |

The enclosing of the mouth parts under the rostrum is correlated with feeding habits, i.e. these organs have never become highly developed for prehension or attack as in the Parasitiformes (and the saber-toothed tiger), but remain protected by the chitinous hood.

The presence of the tracheae is a secondary development as they are absent in the Phthiracaridae, in the primitive Oribatids, larvae and nymphs, while they are poorly developed in intermediate groups like the Nothrinae, and long and convoluted in the highly specialized Pterogasterines. Thus again, there is no phylogenic connection. The development of the tracheae in these minute forms is necessitated by and correlated with the degree of chitinization of the skin.

Fusion of coxae and reduction of palp segments designate orthogenic trends.

Conditions of tarsal armature are correlated with life habits, and are strongly divergent tendencies. For instance, in the Acaridiae special structures are developed to enable host relations. In the Oribatoidea the single hook becomes three in the more advanced species, either by reduplication or by splitting on either or both sides, first as thin blades, also as equally stout. The presence of these subsidiary hooks has all the appearance of a mutation. For instance, in the species *Pseudotritia ardua* small races have one nail, while the robust northern form is triheterohamate. In the genus Ameronothrus one hook appears in some species, three in others without correlation, just as they happen to mutate, but breeding true to type once the type is established. In the most highly specialized genera one finds three hooks unexceptionally—though one might expect a single hook in the smallest species. The hooked unguis is the normal ambulatory armature found in the larvae and the primitive groups of most terrestrial Arthropods and is therefore the most primitive condition. The clinging structures developed in the parasitic forms are specializations. Thus the ungual armature is correlated with substratum, secondarily with feeding habits (as in parasitic forms).

Chitinization of body is again an independent development correlated with inoffensive, passive feeding habits, i.e. it is developed as a protection. This is clear from the fact that it is poorly developed in the larvae, better developed in the nymphs

and primitive groups, and highly developed in the winged and long-legged species (i.e. in the climax groups).

Sexual dimorphism is often found in parasitic groups. That it is not developed in the Oribatoidea is not surprising.

Thus it is evident that most of the differential characters are due to the dense chitinization and that this in turn is a protective device necessitated by the passive, feeding habits.

Size is probably a result of the mechanics of structure.

In brief then, the majority of differences between the Oribatoidea and the Acaridiae are that the moss mites are primitive in feeding habits and the Acaroids are specialized.

These characters may be regrouped as follows:

I. Orthogenic characters:
  Reduction in number of mandible segments (to 2)
  Reduction in number of maxillary palp segments (to 3-5)
  Reduction in number of leg segments (to 5-6)
II. Feeding habits: free, vegetarian, resulting in:
  Inoffensive mouth parts—covered by rostrum
  Chitinization of body wall—for protection, necessitating:
    Development of tracheae
    Small size, resulting in:
      Lack of heart
      Lack of "malpighian tubes"
  Development of midgut caeca
  Primitive unguis (ambulatory)
III. Primitive larvae.

Thus the Oribatoidea may be subordinally related to the Acaridiae in that (1) the larvae of some of the Oribatoidea resemble the most primitive of the Acaridiae, (2) the number (a) of mandible segments (b) maxillary segments (c) leg segments are similarly reduced. They *differ* in several striking structural characters necessitated by their markedly different *feeding* habits.

The primitive feeding habits correlated with presence of segmentation should place the Oribatoidea anterior to the Parasitiformes, while the reduced appendages would place them posterior to the Parasitiformes. As the development of the predaceous and parasitic habits with their accompanying structural modifications is a more rapid acquisition than reduction of appendicular segments, the Oribatoidea may be regarded as more highly specialized, more deeply modified than

the Parasitiformes and placed posteriorly—along with the Acaridiae.

To be more specific, the Oribatoidea are far more primitive than the highly diversified and modified parasitic Monacotricha and Anacotricha (of the Acaridiae). Likewise they are distinctly more primitive than the parasitic families of the Diacotricha but more specialized than the saprophytic families. At present these Diacotricha are so poorly understood that it would be a waste of time to endeavor to determine the immediate relationships of the Oribatoidea with these saprophytic Diacotricha, suffice it to say that it is *near* the Tyroglyphoids. Thus the true position of the moss mites would be among the Diacotricha of the Acaridiae. In this connection it should be remembered that some of the Oribatoidea have (1) abdominal segmentation, (2) *six* leg segments, the coxae being invaginated,[2] (3) no praetarsus,[3] (4) a five segmented maxillary palp.[4] Thus it is incorrect to say that the Oribatoidea are chitinized Acaridiae, but one might say they are chitinized Tyroglyphoids.

## Some Notes on California Thrips (Thysanoptera).

By STANLEY F. BAILEY, University of California.

Some notes have recently been gathered on several species of California Thysanoptera which add somewhat to the knowledge of their distribution and host plants.

HERCOTHRIPS FEMORALIS (Reuter.) Mr. L. M. Smith reported this species as causing considerable damage to a cactus garden at San Jose, California, during April, 1931. The majority of the plants attacked belong to the family Crassulaceae and are *Kalanchoe marmorata, Cotyledon maximum, Sempervivum maraianatum, Pleiospilus bolusii, Fancaria tigrina,* and *Crassula monticola.* Only one true cactus (*Cereus ocamponis*) was attacked.

At Davis, California, during May and June, 1931, sugar beets grown in a greenhouse for experimental purposes were found to be heavily infested. There is a distinct preponderance of females in this species and the males were only occasionally taken.

HELIOTHRIPS HAEMORRHOIDALIS (Bch.). Two records of the greenhouse thrips living out-of-doors in California have recently come to hand. Prof. E. O. Essig reports this thrips

[2] Id., p. 81. [3] Id., p. 82. [4] Id., p. 84.

as damaging the foliage of persimmons at Santa Barbara, October 13, 1930, and Mr. R. L. Usinger collected it on ornamentals (plants not determined) at Oakland during April, 1931.

ODONTOTHRIPS LOTI Haliday. Both sexes were taken by Mr. L. M. Smith and the author on wild vetch (*Vicia sativa* L.) at Monticello, California on March 3, 1931, and by the author on *Lactuca scariola* L. at Davis, California, on June 27, 1931.

SERICOTHRIPS VARIABILIS (Beach). This species has been taken on *Ceanothus* at Davis, California, during June in both 1930 and 1931. The plant is in blossom at this time and the thrips may be found in large numbers in the flowers but decreases as the summer progresses, and has not been taken during the remainder of the year on this host. The male of the species is not very common.

AEOLOTHRIPS KUWANI Moulton. This apparently predacious thrips has been observed at Davis, California, on pear, prune, apple, and *Lactuca scariola* L. during May and June, 1930 and 1931. Pupation occurs on the host in curled leaves, abandoned spiders' webs, etc.

ANAPHOTHRIPS STANFORDI (Moulton). Apterous females were taken on *Lactuca* at Berkeley, California, on Dec. 6, 1930.

LIOTHRIPS VARICORNIS Hood. A large number of adults and larvae were taken in hollyhock (*Althaea rosea*) flowers at Davis, California, on October 19, 1929.

I am indebted to Mr. John B. Steinweden, assistant to Mr. Dudley Moulton, for making determinations of several of the above species.

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**Corrections in Nomenclature (Diptera, Asilidae).**

In my paper on the genus *Microstylum* in Madagascar, published in the Transactions of the American Entomological Society, LII, pp. 201-207, 1927, I described a new species under the name of *griseum*. Due to a printer's error, this appeared at the head of the description as *giseum*, the second letter being omitted. In the key preceding the description the spelling is correct, *griseum*.

In American Museum Novitates, No. 334 (1928), p. 2, I described *Erax willistoni*. As this name is preoccupied (*E. willistoni* Hine, Annals Ent. Soc. America, XII, 110, 1919), I therefore propose the name *neowillistoni*.

In my paper, A Review of the Genus *Proagonistes* (Annals and Magazine of Natural History, ser. 10, vol. VI, 1930), in the key to species on p. 214, the alternate couplet under No. 4 was omitted in printing. The couplet under No. 4 should read:

"4. Hind tarsi with fine black hairs, causing them to appear black above .....5
Hind tarsi with reddish hairs .....6."

STANLEY W. BROMLEY.
Ohio State University, Columbus, Ohio.

## Ant Communities of a Section of the Sagebrush Semi-Desert in Idaho, with Special Reference to the Vegetation (Hymenop.: Formicidae).

By A. C. Cole, Jr., Ohio State University.

An area one-tenth of a mile square was selected in the sagebrush semi-desert near Twin Falls, Idaho, in which to conduct a survey of the principal ant communities. This area consisted of three distinct parts; firstly, a ledge of overhanging rocks along the north side of the square; secondly, a small stream along the south side; and thirdly, an intervening, somewhat level, sandy area. The principal vegetation of each of these three units is listed in table 1. *Agropyron repens* (L.) Beauv.

TABLE 1.

Vegetation of Three Semi-Desert Biotic Communities.

*The Solenopsis molesta-Agropyron repens Community.*

| Frequent. | Scarce. |
|---|---|
| Agropyron repens (L.) Beauv. | Bromus tectorum L. |
| Cirsium arvense (L.) Scop. | Chrysothamnus graveolens (Nutt.) Greene |

*The Lasius niger americanus-Salsola pestifer Community.*

| Frequent. | Scarce. |
|---|---|
| Salsola pestifer A. Nels. | Atriplex rosea L. |
| Aster sp. | |

*The Formica subpolita-Artemisia tridentata Community.*

| Frequent. | Scarce. |
|---|---|
| Artemisia tridentata Nutt. | Agropyron repens (L.) Beauv. |
| Chrysothamnus graveolens (Nutt.) Greene | |
| Bromus tectorum L. | |

(Bunchgrass) dominated along the rocky ledge, *Salsola pestifer* A. Nels. (Russian Thistle) on the stream margin, and *Artemisia tridentata* Nutt. (Sagebrush) in the central area. The overhanging ledge of rocks provided a shaded habitat in the afternoon and prevented the rapid evaporation of soil moisture. The soil of this portion was a sandy loam. Along the stream the soil was very moist and consisted of a rich loam, while in the unshaded central area it was dry and sandy.

THE BIOTIC COMMUNITIES *

1. *The Solenopsis molesta-Agropyron repens Community*

The ant *Solenopsis molesta* Say dominated in this community in which there were a few colonies each of *Crematogaster lineolata* Say, *Monomorium minimum* Buckley, *Pheidole vinelandica longula* Emery, *Pheidole sp.*, and *Camponotus hyatti* Emery. (Table 2.) One colony of a species of Myrmica was

TABLE 2.

ANTS OF THREE SEMI-DESERT BIOTIC COMMUNITIES.

| | |
|---|---|
| *The Solenopsis molesta-Agropyron repens Community.* | |
| Solenopsis molesta Say | 13† |
| Crematogaster lineolata Say | 6 |
| Monomorium minimum Buckley | 5 |
| Pheidole vinelandica longula Emery | 4 |
| Camponotus hyatti Emery | 2 |
| Pheidole sp. | 2 |
| Myrmica sp. | 1 |
| *The Lasius niger americanus-Salsola pestifer Community.* | |
| Lasius niger americanus Emery | 22† |
| Solenopsis molesta validiuscula Emery | 17 |
| Tapinoma sessile Say | 12 |
| Camponotus maculatus vicinus nitidiventris Emery | 8 |
| Formica neogagates neogagates Emery | 6 |
| Leptothorax curvispinosus rugatulus Emery | 4 |
| Pheidole sp. | 4 |
| Lasius umbratus mixtus aphidicola Walsh | 3 |
| Formica fusca var. | 1 |
| Lasius niger sitkaënsis Pergande | 1 |
| *The Formica subpolita-Artemisia tridentata Community.* | |
| Formica subpolita Mayr | 46† |
| Pogonomyrmex occidentalis Cress | 18 |
| Formica rufa obscuripes Forel | 14 |
| Formica fusca neorufibarbis Emery | 12 |
| Formica fusca var. | 4 |
| Formica sanguinea subnuda Emery | 2 |
| Formica pallide-fulva var. | 1 |

also represented. All of the above ants were beneath flat rocks.

2. *The Lasius niger americanus-Salsola pestifer Community*

*Lasius niger americanus* Emery was the dominant ant, while

* Expressed in terms of the dominant ant and the dominant plant.
† The figures indicate the number of colonies.

*Solenopsis molesta validiuscula* Emery, *Tapinoma sessile* Say, and *Camponotus maculatus vicinus nitidiventris* Emery were frequent. Less commonly represented were *Formica neogagates neogagates* Emery, *Leptothorax curvispinosus rugatulus* Emery, *Pheidole sp.*, and *Lasius umbratus mixtus aphidicola* Walsh. *Formica fusca* var. and *Lasius niger sitkaënsis* were rare. (Table 2.) All of the colonies were found beneath flat rocks.

3. *The Formica subpolita-Artemisia tridentata Community*

The most abundant ant in this community was *Formica subpolita* Mayr. *Pogonomyrmex occidentalis* Cresson and *Formica rufa obscuripes* Forel were common, while *Formica fusca neorufibarbis* Emery and *Formica fusca* var. were less frequent, and *Formica sanguinea subnuda* Emery and *Formica pallide-fulva* var., rare. (Table 2.)

*Formica obscuripes* was represented by mounds of detritus formed around clumps of sagebrush, and pebble mounds of *Pogomomyrmex occidentails* were abundant in the bromegrass area between the shrubs. The remaining species were all beneath scattered stones.

## Discussion.

From a study of this nature we see that the habitat of a species of ant is greatly determined by the physical factors of the environment, or the vegetational equivalent. A culmination of factors acting upon the existing vegetation determines whether or not it shall continue to remain in the habitat; likewise, this same group of factors directly, through contact with the ant colonies, or indirectly, through the vegetation types, affects the entire ant fauna of a given community. It determines the quantitative as well as the qualitative composition of the area, and, unless the establishment of the ants is of a contingent nature, it also determines whether or not there shall be this establishment.

The food relations of these associated ants are of prime importance. The members of the genus *Pheidole,* of which three species are represented in our community, are nutritionally dependent upon seeds from adjoining vegetation. This is also true of *Pogomomyrmex occidentalis* and to a lesser extent of *Formica subpolita.* An abundance of annual and perennial

grasses with readily available seeds is an enticement to the establishment, and a factor influencing the continued existence, of the granivorous species of ants. The presence of sagebrush lends itself to the rapid establishment of *Formica obscuripes*. In such a habitat food is rather easily accessible.

It is of consequence that the physical and biotic nature of the semi-desert region is continually, and often rapidly, changing. Vegetation increases and decreases in size, abundance, and composition, annual and seasonal temperatures and precipitation suffer great fluctuations, the nature of the soils is variable, both physically and chemically, the water courses, both surface and subterranean, deviate from their paths, and, with all this, the ant fauna changes to a remarkable extent. New forms invade the area and become established, some permanently, if they are able to cope with rapidly changing conditions, and others only temporarily. Incipient nests are founded by old colonies, some of them fortuitously extending their range into new and previously unoccupied regions, over precarious barriers of climate and topography. The investigator cannot help but observe, from year to year and from decade to decade, the physical and biotic instability of the habitat. Upon a complex of interrelated factors must an individual live, so upon another must it die. The changeability of even a single factor may "push over the dominos" and affect the last link in the chain. The ant, as an organism, is, therefore, directly or indirectly dependent upon all phases of its diversified environment. It is itself a factor producing this environment and a product of it.

## An Opportunity.

It will be of interest to all workers in Biology to learn that the Council of the Biological Society of Washington, at its last meeting, has voted the granting of a special price reduction on the following of its publications: "Natural History of the District of Columbia," by W. L. McAtee, 142 pages, inset map, octavo, paper, 1918. "The International Rules of Zoological Nomenclature," 28 pp. octavo, paper, 1926. "Birds of the Washington, D. C. Region," by May Thatcher Cooke. 79 pp. octavo, paper, 1929. These can be obtained from the Society's corresponding secretary, J. S. Wade, U. S. Bureau of Entomology, Washington, D. C. Requests should be sent promptly as only a very limited number of copies remain.

## Color Changes in Preserved Specimens of Dynastes tityus (Coleop.: Scarabaeidae).

By P. W. FATTIG, Emory University, Georgia.

For several years I have been observing the *Dynastes tityus* Linn. (Coleoptera) in my collection, trying to find out why some of the specimens change color.

Blatchley in his Coleoptera of Indiana says that these beetles are "greenish-gray with brownish or piceous spots scattered irregularly over the elytra." He also comments upon the eight specimens in their collection as follows— "One of the females is wholly chestnut-brown above; while one of the males has one elytron almost wholly chestnut-brown, the other one being of a normal hue."

I have one specimen, a male, taken at Springfield, Ohio, on May 14, 1915. This specimen was of the natural color. It remained this way for at least two years. While teaching at the State Teachers College at Valley City, North Dakota, I showed this specimen to some of my students in the Spring of 1918, and was surprised to find that the right elytron of this male had changed to a chestnut-brown. I did not notice this specimen again for about two years, when at Gainesville, Florida, I opened the box again, and was very greatly surprised to find that the beetle had changed back to its normal color. It remained this way for three or four years, when the right elytron again changed to the chestnut-brown color. At the present time, both elytra are chestnut-brown in color.

When I first noticed the change in color, I explained it by saying that when the pin had been run through the right elytron, that some of the body fluids had come into contact with the elytron, and that these fluids had finally caused the elytron to change to the chestnut-brown color. When the elytron had changed back to its original color, I was puzzled in trying to find an explanation.

I have the following pinned specimens—One female, taken at Gainesville, Florida, June 18, 1919, which has remained normal in color; one female, Atlanta, Georgia, July 11, 1928, in which the right elytron and the thorax have changed to a chestnut-brown color; one male, Atlanta, Georgia, October 1, 1927, in which both elytra and the thorax have changed to a reddish-

brown color; one male, Atlanta, Ga., July 8, 1928, which has remained normal in color.

I have a male from Farmville, Virginia, which I took from the pupa case on May 5, 1925. This was an adult specimen. During the past year, the right elytron has changed to a chestnut-brown color.

I have the following papered specimens—one female, Atlanta, Ga., July 8, 1928, in which both elytra and the thorax have changed to a chestnut-brown color; one female, Atlanta, Ga., July 10, 1928, which has remained normal in color; one female, Atlanta, Ga., July 8, 1928, which is now changing in color (both the elytra and the thorax); one male, Atlanta, Ga., July 11, 1928, in which the thorax has changed to a chestnut-brown color; one male, Atlanta, Ga., July 9, 1928, which has remained normal in color; one male, Griffin, Ga., June 22, 1930, which has remained normal in color; one female, Atlanta, Ga., June 18, 1929, in which both elytra and the thorax have changed to a chestnut-brown color; one female, Atlanta, Ga., September 3, 1928, which has remained normal in color; one female, Atlanta, Ga., July 11, 1929, in which both the elytra and the thorax are changing in color; one female, Atlanta, Ga., July 15, 1929, which is changing in color (both the elytra and the thorax); one female, Atlanta, Ga., July 2, 1927, in which both elytra and the thorax have changed to a chestnut-brown color.

All of the specimens were normal in color when captured. All have been kept under the same conditions.

The most peculiar of these specimens is the male from Springfield, Ohio, in which the right elytron changed to a chestnut-brown color, and then again changed back to the normal color, and thus remained for at least four years, when the right elytron again changed to the chestnut-brown color, and finally the left elytron changed to the chestnut-brown color. The thorax of this specimen has remained normal in color during all of these color changes, so far as I have observed the color changes. The Atlanta, Ga., July 11, 1928, specimen is also interesting in that the thorax only has changed in color. The three specimens which are changing in color present a peculiar appearance. I believe that they will finally have the same color as the others which have changed in color.

**A Parasitic Hymenopteron as a Vector of an Insect Disease.**

The importance of insects as vectors of human disease has been appreciated for many years. Yellow fever, malaria and other diseases are now largely controlled by combating their insect vectors. More recently the role of insects as carriers of plant diseases has been established. Such diseases as curly-top in sugar beets and tip-burn in potatoes are spread by means of insects. However that insects may serve as carriers of insect diseases has not been generally recognized.

Insect parasites which normally pass from host to host may carry disease. The parasitic Hymenoptera which paralyze their hosts by stinging may carry disease organisms on their ovipostors. If the insect which is stung is carried to the nest of the Hymenopteron and there devoured, the presence of germs on the ovipositor is not a factor in the spread of disease among a general population of insects. However when the insects which are stung are allowed to remain where they are, and the parasite passes from insect to insect the ovipositor of the stinging insect may be a factor in spread of disease. In addition when the insect stung is not always completely paralyzed and may be able to move about the importance of disease transmission is greater than when the insect is completely paralyzed.

*Microbracon hebetor* Say [Braconidae] stings larvae of the Mediterranean flour moth, *Ephestia kühniella* Zeller. Eggs are not deposited on the paralyzed caterpillars but are laid under or near the larvae. The wasp larvae on hatching crawl to the host and feed on it as external parasites. At times the host larvae are incompletely paralyzed. Also the parasite larvae do not always find the host. Among the host larvae is a sporozoan disease caused by *Thelohania ephestiae* Mattes. The earliest foci of the disease occur in the ganglia of the central nervous system. The disease can be recognized when the larvae are still alive by the diseased larvae having a large head and a small body. It is of interest that the infected larvae have badly coordinated crawling movements.

The transfer of *Thelohania ephestiae* Mattes by the wasp *Microbracon hebetor* Say rests on the following evidence: The disease cannot be transmitted by mouth. Diseased larvae can be kept in the same culture dish with healthy larvae without infecting them. The disease follows parasitic attack. The first point of infection is in the ganglion pierced by the parasitic wasp. Later the causative organism is found in both the nervous system and the fat body. NELLIE M. PAYNE.

## List of the Titles of Periodicals and Serials Referred to by Numbers in Entomological Literature in Entomological News.

1. Transactions of The American Entomological Society. Philadelphia.
2. Entomologische Blätter, red. v. H. Eckstein etc. Berlin.
3. Annals of the Carnegie Museum. Pittsburgh, Pa.
4. Canadian Entomologist. London, Canada.
5. Pysche, A Journal of Entomology. Boston, Mass.
6. Journal of the New York Entomological Society. New York.
7. Annals of the Entomological Society of America. Columbus, Ohio.
8. Entomologists' Monthly Magazine. London.
9. The Entomologist. London.
10. Proceedings of the Ent. Soc. of Washington. Washington, D. C.
11. Deutsche entomologische Zeitschrift. Berlin.
12. Journal of Economic Entomology, Geneva, N. Y.
13. Journal of Entomology and Zoology. Claremont, Cal.
14. Entomologische Zeitschrift. Frankfurt a. M., Germany.
15. Natural History, American Museum of Natural History. New York.
16. American Journal of Science. New Haven, Conn.
17. Entomologische Rundschau. Stuttgart, Germany.
18. Internationale entomologische Zeitschrift. Guben, Germany.
19. Bulletin of the Brooklyn Entomological Society. Brooklyn, N. Y.
20. Societas entomologica. Stuttgart, Germany.
21. The Entomologists' Record and Journal of Variation. London.
22. Bulletin of Entomological Research. London.
23. Bollettino del Laboratorio di Zoologia generale e agraria della R. Scuola superiore d'Agricultura in Portici. Italy.
24. Annales de la société entomologique de France. Paris.
25. Bulletin de la société entomologique de France. Paris.
26. Entomologischer Anzeiger, hersg. Adolf Hoffmann. Wien, Austria.
27. Bolletino della Società Entomologica. Genova, Italy.
28. Ent. Tidskrift utgifen af Ent. Föreningen i Stockholm. Sweden.
29. Annual Report of the Ent. Society of Ontario. Toronto, Canada.
30. The Maine Naturalist. Thornaston, Maine.
31. Nature. London.
32. Boletim do Museu Nacional do Rio de Janiero. Brazil.
33. Bull. et Annales de la Société entomologique de Belgique. Bruxelles.
34. Zoologischer Anzeiger, hrsg. v. E. Korschelt. Leipzig.
35. The Annals of Applied Biology. Cambridge, England.
36. Transactions of the Entomological Society of London. England.
37. Proceedings of the Hawaiian Entomological Society. Honolulu.
38. Bull. of the Southern California Academy of Sciences. Los Angeles.
39. The Florida Entomologist. Gainesville, Fla.
40. American Museum Novitates. New York.
41. Mitteilungen der schweiz. ent. Gesellschaft. Schaffhausen, Switzerland.
42. The Journal of Experimental Zoology. Philadelphia.
43. Ohio Journal of Sciences. Columbus, Ohio.
44. Revista chileña de historia natural. Valparaiso, Chile.
45. Zeitschrift für wissenschaftliche Insektenbiologie. Berlin.
46. Zeitschrift für Morphologie und Ökologie der Tiere. Berlin.
47. Journal of Agricultural Research. Washington, D. C.
48. Wiener entomologische Zeitung. Wien, Austria.
49. Entomologische Mitteilungen. Berlin.
50. Proceedings of the U. S. National Museum. Washington, D. C.
51. Notulae entomologicae, ed. Soc. ent. Helsingfors. Helsingfors, Finland.
52. Archiv für Naturgeschichte, hrsg. v. E. Strand. Berlin.

53. Quarterly Journal of Microscopical Science. London.
54. Annales de Parasitologie Humaine et Compareé. Paris.
55. Pan-Pacific Entomologist. San Francisco, Cal.
56. "Konowia". Zeit. für systematische Insektenkunde. Wien, Austria.
57. La Feuille des Naturalistes. Paris.
58. Entomologische Berichten. Nederlandsche ent. Ver. Amsterdam.
59. Encyclopédie entomologique, ed. P. Lechevalier. Paris.
60. Stettiner entomologische Zeitung. Stettin, Germany.
61. Proceedings of the California Academy of Sciences. San Francisco.
62. Bulletin of the American Museum of Natural History. New York.
63. Deutsche entomologische Zeitschrift "Iris". Berlin.
64. Zeitschrift des österr. entomologen-Vereines. Wien.
65. Zeitschrift für angewandte Entomologie, hrsg. K. Escherich. Berlin.
66. Report of the Proceedings of the Entomological Meeting. Pusa, India.
67. University of California Publications, Entomology. Berkeley, Cal.
68. Science. New York.
69. Comptes rendus hebdoma. des séances de l'Académie des sciences. Paris.
70. Entomologica Americana, Brooklyn Entomological Society. Brooklyn.
71. Novitates Zoologicae. Tring, England.
72. Revue russe d'Entomologie. Leningrad, USSR.
73. Quarterly Review of Biology. Baltimore, Maryland.
74. Sbornik entomolog. národniho musea v Praze. Prague, Czechoslavokia.
75. Annals and Magazine of Natural History. London.
76. The Scientific Monthly. New York.
77. Comptes rendus heb. des séances et mémo. de la soc. de biologie. Paris.
78. Bulletin Biologique de la France et de la Belgique. Paris.
79. Koleopterologische Rundschau. Wien.
80. Lepidopterologische Rundschau, hrsg. Adolf Hoffmann. Wien.
81. Folia myrmecol. et termitol. hrsg. Anton Krausse. Bernau bei Berlin.
82. Bulletin, Division of the Natural History Survey. Urbana, Illinois.
83. Arkiv för zoologie, K. Svenska Vetenskapsakademien i. Stockholm.
84. Ecology. Brooklyn.
85. Genetics. Princeton, New Jersey.
86. Zoologica, New York Zoological Society. New York.
87. Archiv für Entwicklungs mechanik der Organ., hrsg. v. Roux. Leipzig.
88. Die Naturwissenschaften, hrsg. A. Berliner. Berlin.
89. Zoologische Jahrbücher, hrsg. v. Spengel. Jena, Germany.
90. The American Naturalist. Garrison-on-Hudson, New York.
91. Journal of the Washington Academy of Sciences. Washington, D. C.
92. Biological Bulletin. Wood's Hole, Massachusetts.
93. Proceedings of the Zoological Society of London. England.
94. Zeitschrift für wissenschaftliche Zoologie. Leipzig.
95. Proceedings of the Biological Soc. of Washington, Washington, D. C.
96. La Cellule. Lierre, Belgium.
97. Biologisches Zentralblatt. Leipzig.
98. Le Naturaliste Canadien. Cap Rouge, Chicoutimi, Quebec.
99. Mélanges exotico-entomologiques, Par Maurice Pic. Moulins, France.
100. Bulletin Intern., Acadêmie Polonaise des Sci. et des Lett. Cracovie, Poland.
101. Tijdschrift voor entomologie, Nederlandsche Entomol. Ver., Amsterdam.
102. Entomologiske Meddelelser, Entomologisk Forening, Copenhagen.
103. Journal of the Kansas Entomological Society, Lawrence, Kansas.
104. Revista de la Sociedad entomologica Argentina, Buenos Aires.
105. Revista Entomologia, São Paulo, Brazil.
106. Anales Sociedad Cientifica Argentina, Buenos Aires.

# Entomological Literature

COMPILED BY LAURA S. MACKEY UNDER THE SUPERVISION OF E. T. CRESSON, JR.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The **figures within brackets** [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of ENTOMOLOGICAL NEWS for 10c. The number of, or annual **volume**, and in some cases the part, heft, &c. the latter **within** ( ) follows; then the pagination follows the **colon** :

All continued papers, with few exceptions, are recorded only at their first installments.

*Papers containing new forms or names have an * preceding the author's name.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

☞*Note the change in the method of citing the bibliographical references, as* **explained above.**

*Papers published in the Entomological News are not listed.*

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**Hoffmeyer, E. B.**—Ueber sensillen in den Hymenopterenflügeln. [102] 18: 58-74, ill. **MacGregor, M. E.** — Certain pathological effects of ultra-violet radiation on mosquito larvae and pupa. [Pro. R. Soc., London] 112, (B): 27-38, ill. **Marshall & Staley** — On the distribution of air in the oesophageal diverticula and intestine of mosquitoes. [Parasitology] 24: 368-381, ill. **Mellanby, K.**—Effects of temperature and humidity on the metabolism of the fasting bedbug (Cimex lectularius), Hemiptera. [Parasitology] 24: 419-428, ill. **Norris, M. J.** — Contributions towards the study of insect fertility. I. The structure and operation of the reproductive organs of the genera Ephestia and Plodia (Phycitidae). [93] 1932: 595-611, ill. **Storey, H. H.**—The inheritance by an insect vector of the ability to transmit a plant virus. [Pro. R. Soc., London] 112, (B): 46-60, ill. **True, G. H.**—Studies of the anatomy of the pajaroello tick, Ornithodorus coriaceus. [67] 6: 48pp., ill. **Wigglesworth, V. B.**—The hatching organ of Lipeurus columbae (Mallophaga), with a note on its phylogenetic significance. [Parasitology] 24: 365-367, ill.

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**ORTHOPTERA — *Karny, H. H.** — Ueber einige neotropische Gryllacrinen (Gryllacridae). [48] 49: 97-105, ill.

**HEMIPTERA—*Barber, H. G.**—A new species of Rhodnius from Panama (Reduviidae). [91] 22: 514-517, ill. ***Barber, H. G.**—Three new species of Exptochiomera from the United States (Lygaeidae). [6] 40: 357-363, ill. ***Essig, E. O.** — A genus and species of the family Aphididae new to North America. [67] 6: 8pp., ill. **Hookom, D. W.**—A study of the Membracidae known to occur in Iowa. [Pro. Iowa Acad. Sci.] 37: 385-386. ***Hungerford, H. B.**—A new Potamobates (Gerridae). [19] 27: 228-230. **Osborn, H.**—

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**tinger, F.**—Die Coccinelliden, ihr "Ekelblut" ihre warntracht und ihre feinde. [97] 52: 385-412. ***Janssens, A.**—Description d'un Phanaeide inédit (Copride). [33] 72: 119-122, ill. (S). ***Kessel, F.**—Fauna Brasiliensis Coleopterologica. Lef. 1-2. p. 1-72. [mimeographed]. **McKenzie, H. L.**—The biology and feeding habits of Hyperaspis lateralis (Coccinellidae). [67] 6: 20pp., ill. **Maulik, S.**—On the structure of larvae of Hispine beetles. II. [93] 1932: 293-322, ill. **Nicolay & Weiss**—Synopsis of the Cicindelidae. [6] 40: 341-355. **Park, O.**—The food of Batrisodes globosus (Pselaphidae). [6] 40: 377-378. **Rockenbach, E.**—A study of variation in the markings of Chauliognathus pennsylvanicus and Chauliognathus marginatus. [Pro. Iowa Acad. Sci.] 37: 393-396, ill. ***Schaeffer, C.**—Notes on some Galerucinae with descriptions of new species (Chrysomelidae). [4] 64: 236-239. ***Schaeffer, C.**—Notes on some Halticinae with descriptions of new species (Chrysomelidae). [19] 27: 239-245. **Sim, R. J.**—Five Sericine beetles. [6] 40: 379-382, ill.

**HYMENOPTERA**—***Aguayo, C. G.**—Notes on West Indian ants. [19] 27: 215-227. ***Alfken, J. D.**—Die chilenischen arten der gattung Caenohalictus. [52] N. F. 1: 654-659. **Cole, A. C.**—Observations on semi-dessert ants. [43] 32: 533-538, ill. **Fisher, K.**—Agriotypus armatus and its relations with its hosts. [93] 1832: 451-461, ill. **Muesebeck, C. F. W.**—The genus Mesocoelus (Braconidae). [95] 45: 227-230, ill. **Nielsen, E. T.**—Sur les habitudes des Hyménoptères aculéates solitaires. (Bethylidae, Scoliidae, Cleptidae, Psammocharidae). [102] 18: 1-57, ill. **Richards, O. W.**—Some notes on the humble-bees allied to Bombus alpinus. [Tromso Mus. Arshefter] 50, No. 6: 32pp., ill. ***Stitz, H.**—Formicidae [of the Wollebaek Galapagos Expedition]. [Nyt Mag. f. Naturv., Oslo] 71: 367-372, ill. **Wheeler, W. M.**—How the primitive ants of Australia start their colonies. [68] 76: 532-533.

## Doings of Societies

The ninth annual Rocky Mountain Conference of Entomologists was held in Pingree Park, Colorado, August 15 to 20, 1932, inclusive. A total of 88, which is the largest number to have attended any of the Conferences, registered during the week. Forty-six of these were directly interested in entomology; the others being friends or members of families.

A total of 10 sessions were held for the presentation of papers: The following is a list of the more formal subjects discussed:

Arachnida.—Life History of the Hour Glass Spider, P. B. Lawson.

Coleoptera.—White Grubs, C. L. Fluke; White Grubs in Iowa, Bernard Travis.

Homoptera.—Cercopidae, Katherine C. Doering; Taxonomic Aspects of Aphids on Ribes, Miriam A. Palmer; The Potato Psyllid, L. B. Daniels.

Lepidoptera.—Codling Moth Control in Missouri, Leonard Haseman; *Stretchia plusiiformis* Hy. Edwards, a Pest on Gooseberries, J. L. Hoerner; The Cabbage Looper on Lettuce, S. C. McCampbell; *Mineola scitulla* Hulst., an Enemy of Stone Fruit in Idaho, Claude Wakeland.

Orthoptera.—Grasshopper Bait Tests in Colorado, F. T. Cowan.

Diptera.—Notes on the Stratiomyiidae in Colorado, Maurice T. James.

Hymenoptera.—Paper Wasps of Utah, C. L. Hayward; The Romance of the Honeybee, F. B. Paddock.

General.—Pasture Insect Investigations, Donald A. Wilbur; University Life in England and Civic Life on the Continent, Illustrated, J. E. Ackert; Remarks on Insecticide Research, C. H. Richardson; Entomological Supplies, Alexander B. Klots; sub-Specific Nomenclature of Insects, Alexander B. Klots; The Role of Insects in the Food of Trout in the Rocky Mountain Region, John W. Scott; The Preparation of Granulated Honey for the Market, R. G. Richmond; Faunal Survey of Colorado, F. Martin Brown.

Symposium.—Entomological Collections of the Rocky Mountain Region. Leaders, Vasco M. Tanner, F. Martin Brown and C. L. Fluke.

The symposium on entomological collection for the Rocky Mountain region led to the appointment of a committee consisting of F. Martin Brown, Vasco M. Tanner and Geo. M. List, Chairman, to encourage the various workers that collect

in the Rocky Mountain region to return to museums in that area, representative material whenever this is possible. It was felt there is a very urgent need for this cooperation between workers of the various sections in order to build up more representative collections in the west that will be available for students of the region.

More than the usual number of systematists were present at the meeting, which resulted in a large number of specimens being taken. The following is a list of entomologists attending the meeting; F. B. Paddock, Bernard Travis, C. H. Richardson, Ames, Iowa; Geo. A. Dean, J. E. Ackert, Donald A. Wilbur, C. R. Collins, Manhattan, Kansas; Katherine C. Doering, Paul B. Lawson, Lawrence, Kansas; Claude Wakeland, Moscow, Idaho; Leonard Haseman, Columbia, Mo.; Alexander B. Klots, Elsie B. Klots, Rochester, N. Y.; Otis Wade, Eugene F. Powell, L. M. Gates, Lincoln, Nebraska; A. W. Lindquist, Uvalde, Texas; C. L. Fluke, Madison, Wisconsin; C. L. Hayward, Vasco M. Tanner, Provo, Utah; Lee Jeppson, Brigham City, Utah; John W. Scott, Laramie, Wyoming; L. G. Davis, Grand Junction, Colo.; J. H. Newton, Chas. M. Drage, Paonia, Colo.; Harold E. Rice, E. R. Bliss, Greeley, Colo.; F. Martin Brown, Colorado Springs, Colo.; Orville Hitchcock, Montrose, Colo.; Maurice T. James, Boulder, Colo.; M. A. Palmer, L. B. Daniels, John Weaver, S. C. McCampbell, C. A. Bjurman, R. G. Richmond, G. M. List, Lee Jenkins, Leonard Sweetman, C. P. Gillette, F. T. Cowan, J. L. Hoerner, Jack Manweiler, S. Arthur Johnson, C. R. Jones, Fort Collins, Colo.

Officers elected for 1933 were C. P. Gillette, Chairman; Geo. A. Dean, Vice-chairman; Geo. M. List, Secretary, and C. R. Jones, Treasurer.

GEORGE M. LIST, Secretary.

## OBITUARY

DR. WILLIAM JACOB HOLLAND, director emeritus of the Carnegie Museum, Pittsburgh, Pennsylvania, author of the well-known and widely used *Butterfly Book* and *Moth Book*, died on December 13, 1932, at the age of eighty-four years.

# EXCHANGES

**This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.**

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

**Wanted**—Names and addresses of those desiring Coleoptera and Lepidoptera of southwest Arkansas.—Miss Louise Knobel, E. 3rd St., Hope, Arkansas.

**Wanted**—October, 1919, and December, 1919, copies of Bulletin of the Brooklyn Entomological Society. Cash. Harriet A. Wickwire, 55 Tompkins St., Cortland, N. Y.

**Wanted for Cash or Exchange**—Uncommon species of North American Lepidoptera. Several of each kind. D. V. Brown, Pleasanton, California.

**Butterflies**—Desire correspondence from Western United States, Canada and Alaska. Will exchange rare California material for specimens from your locality. Lloyd M. Martin, P. O. Box 52, Roscoe, California.

**Exchange**—Local Venezuelan (South America) species of lepidoptera offered in exchange for North American species. Oscar Zuloaga, P. O. Box 263, Caracas, Venezuela.

**Exchange.**—Desire Lepidoptera, particularly specimens and data of Wisconsin and U. S. Catocala. Exchange for same. Wm. E. Sieker, 46 Breeze Terrace, Madison, Wisconsin.

**Will buy or exchange**—Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, University of Rochester, Rochester, N. Y.

**Wanted**—Names and addresses of those desiring Insects from Tennessee. Will collect there during June-September, in all orders. Correspondence solicited. B. Benesh, 107 Argonne Drive, North Chicago, Ill.

**Wanted**—West Coast Geometrids for cash or in exchange for California Butterflies. Edward Guedet, P. O. Box 305, Napa, Calif.

**Wanted**—Western species of Bumblebees, all three castes; also Psithyrus and Catocala. A. P. Morse, Peabody Museum, Salem, Mass.

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960.—**Leonard** (M. D.).—Some notes on my Revision of the Rhagionidae. (Trans., 57, 321-323, 1931) ..... .20

962.—**Cresson** (E. T., Jr.).—Studies in the dipterous family Ephydridae. Paper 4. (Trans., 58, 1-34, 1932) ..... .65

965.—**Painter** (R. H.).—A monographic study of the genus Geron Meigen as it occurs in the United States (Bombyliidae). (Trans., 58, 139-167, 2 pls., 1932) ..... .60

### ORTHOPTERA.

964.—**Rehn**, (J. A. G.).—New or little known Neotropical Blattidae, No. 3. (Trans., 58, 103-137, 2 pls., 1932) .... .75

967.—**Hebard** (Morgan).—New species and records of Mexican Orthoptera. (Trans., 58, 201-371, 5 pls., 1932) ..... 3.50

### LEPIDOPTERA

966.—**Bell** (E. L.).—Studies in the genus Phocides with descriptions of new species (Hesperiidae). (Trans., 58, 169-199, 5 pls., 1932) ..... .75

959.—**Cadbury** (J. W.)—A new form of Sphinx gordius (Sphingidae. (Trans., 57, 319-320, 1 pl., 1931) ..... .20

955.—**Williams & Bell.**—Hesperiidae of the Forbes Expedition to Dutch and British Guiana. Two New Hesperids from Ecuador. (Trans., 57, 249-290, ill., 1 col. pl., 1931) 1.25

958.—**Williams** (R. C.)—Cuban Hesperiidae. (Trans., 57, 305-318, 1 c. pl., 1931) ..... .75